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## FACTORS AFFECTING COMMODITY PRICES

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After a most careful consideration of this subject, I have thought best to divide it into four distinct sections and will therefore discuss the matter accordingly. First, I will consider the general question of prices with special reference to the various index numbers used for experimental and other work. In the second section, I will explain the most advanced statistical work which has been done along these lines with special reference to Professor Irving Fisher's "Equation of Exchange," which, to my mind, shows accurately and concretely what factors affect the general price level. In the third section I will refer to other factors which affect the prices of special commodities, or commodities in special localities, and will quote thereon from leading authorities. In the fourth section I will discuss in detail the most advanced work which has been done towards the forecasting of future prices. This last section probably will be found most interesting, and those who have not time to read this entire article should be sure to read this final section entitled "How Commodity Prices May Be Forecast." The most valuable section, from a statistical point of view, will be

found to be Section II, wherein the formula, 
$$\text{Prices} = \frac{M V + M' V'}{\text{Trade}}$$

is explained in detail. This formula has gradually been evolved during the past twenty years by the most constant work on the part of the nation's leading economists, and when its full significance is grasped by manufacturers and merchants, it is bound to have a distinct effect upon the business community.

### *I. General Consideration and Index Numbers*

In the discussion of the factors affecting prices, a misunderstanding often occurs through mixing *wholesale* and *retail* prices. The former are sensitive to commercial and industrial factors, while the latter respond much more slowly. On the other hand, the retail prices are more valuable when considering the cost of

living, and are the prices in which the consumer is more naturally interested. Moreover, although retail dealers immediately mark up their goods as the wholesale price increases, they are loth to mark down their goods when the wholesale price decreases. In this article the prices considered will be usually wholesale prices, and there are several indices available. Our own organization uses the Bradstreet figures, which go back through 1892.

There is another series of index figures which was originally brought out by Dun's commercial agency and which is designed to give the cost of the necessities of life for the individual. The numbers are based on wholesale quotations, the figure for each commodity being multiplied by the annual per capita consumption, in order to give its proper weight in the aggregate. The figures are given in dollars and cents, not being reduced to a percentage basis on the scale of 100. About 350 articles are represented, but no details are given as to the method of calculating the annual per capita consumption upon which the figures are based. This series has been criticised as giving too great importance to food products through the method of weighting the figures. The figures are published each month, but July 1st of each year is stated by the compilers to be the best index of the general state of prices.

There are also other tables which are based on the same assumption, but these are mostly for foreign price indices. Personally, these weighted tables do not appeal to me; but those who believe therein should read the article in the November, 1910, number of the "Quarterly Journal of Economics," by Professor Mitchell, of the University of California. This author has made a very complete study of index numbers, and he shows that ultimately practically all of the different systems give the same result, owing to the great force of the law of averages.

In short, I believe that the simple index as followed by Bradstreet is the most satisfactory for use in the end, and the nature of this method is briefly this. A number of commodities are chosen, and the total price of specified quantities of these articles is ascertained for a given day or averaged for a certain period. The price numbers thus computed are in some tables of index numbers used without further change. Usually, however, such numbers are reduced to percentages of one hundred as the base of comparison. The total price at a chosen date, or the general average for a

specified period, is taken as the base and represented by one hundred, and the price figures are quoted in terms of this base, upward and downward, as prices change. For example, if one hundred articles be chosen, and the total price of one pound of each be ten dollars on January 1, then, taking that figure as the base, or one hundred, the index number for February 1, would be one hundred ten, if the total prices of one hundred articles were found to be \$11 on that date, and it would be ninety, if the total prices were \$9, and so on.

The Bradstreet series gives the totals of the prices per pound of ninety-six articles, quarterly and monthly, since January 1, 1892. In the following table quarterly quotations are given for the entire series:

BRADSTREET'S INDEX NUMBERS OF WHOLESALE PRICES, QUARTERLY, 1892-1911

1892			1899		
Jan. 1	.....	\$8.1382	Jan. 1	.....	\$6.8020
Apr. 1	.....	7.9776	Apr. 1	.....	6.8786
July 1	.....	7.3829	July 1	.....	7.0918
Oct. 1	.....	7.6089	Oct. 1	.....	7.6396
1893			1900		
Jan. 1	.....	7.8317	Jan. 1	.....	8.0171
Apr. 1	.....	7.8395	Apr. 1	.....	8.1275
July 1	.....	7.2869	July 1	.....	7.7215
Oct. 1	.....	7.1717	Oct. 1	.....	7.7507
1894			1901		
Jan. 1	.....	6.9391	Jan. 1	.....	7.5673
Apr. 1	.....	6.6660	Apr. 1	.....	7.5263
July 1	.....	6.5770	July 1	.....	7.5151
Oct. 1	.....	6.5566	Oct. 1	.....	7.7276
1895			1902		
Jan. 1	.....	6.8220	Jan. 1	.....	7.6604
Apr. 1	.....	5.9722	Apr. 1	.....	7.7838
July 1	.....	6.4204	July 1	.....	7.8380
Oct. 1	.....	6.5241	Oct. 1	.....	7.9924
1896			1903		
Jan. 1	.....	6.3076	Jan. 1	.....	8.0789
Apr. 1	.....	5.8691	Apr. 1	.....	8.1247
July 1	.....	5.7019	July 1	.....	7.8706
Oct. 1	.....	5.7712	Oct. 1	.....	7.9083
1897			1904		
Jan. 1	.....	6.1164	Jan. 1	.....	7.9885
Apr. 1	.....	6.0460	Apr. 1	.....	7.9690
July 1	.....	5.8537	July 1	.....	7.6318
Oct. 1	.....	6.4477	Oct. 1	.....	7.9213
1898			1905		
Jan. 1	.....	6.5784	Jan. 1	.....	8.0827
Apr. 1	.....	6.4286	Apr. 1	.....	7.9996
July 1	.....	6.5820	July 1	.....	7.9160
Oct. 1	.....	6.6962	Oct. 1	.....	8.2298

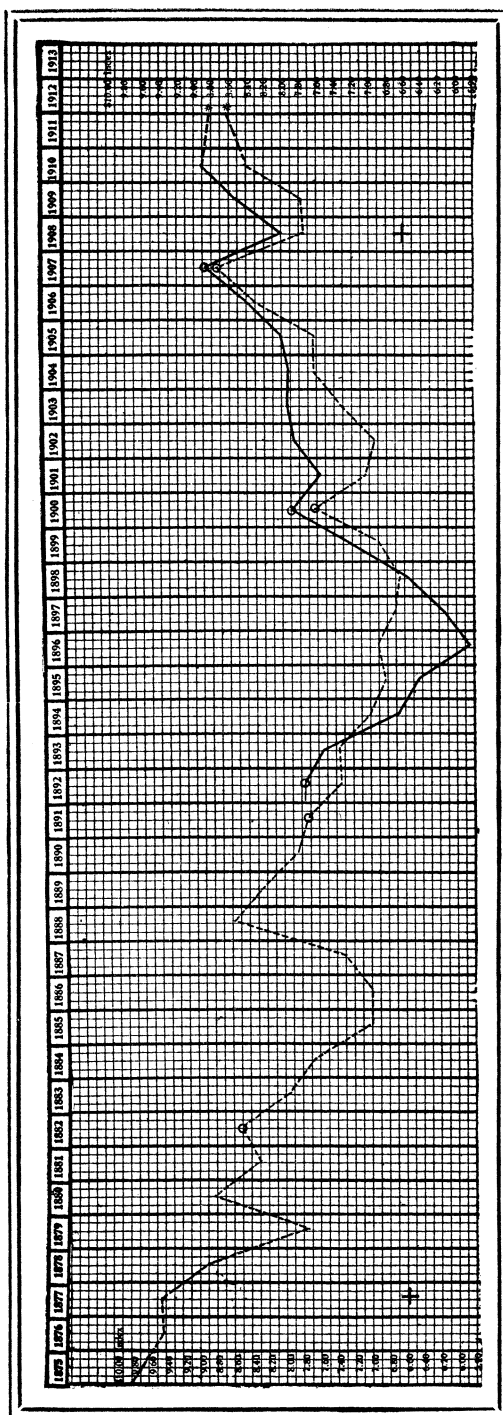
1906			1909		
Jan.	I.	\$8,3289	Jan.	I.	\$8,2631
Apr.	I.	8.2987	Apr.	I.	8.3157
July	I.	8.2835	July	I.	8.4573
Oct.	I.	8.5580	Oct.	I.	8.7478
1907			1910		
Jan.	I.	8.9172	Jan.	I.	9.2310
Apr.	I.	8.9640	Apr.	I.	9.1900
July	I.	8.0409	July	I.	8.9200
Oct.	I.	9.8506	Oct.	I.	8.9200
1908			1911		
Jan.	I.	8.2949	Jan.	I.	8.8361
Apr.	I.	8.0650	Apr.	I.	8.5223
July	I.	7.8224	July	I.	
Oct.	I.	8.0139	Oct.	I.	

## ANNUAL AVERAGES OF BRADSTREET'S INDEX NUMBERS

1892	7.78	1902	7.88
1893	7.53	1903	7.94
1894	6.68	1904	7.92
1895	6.43	1905	8.10
1896	5.91	1906	8.42
1897	6.12	1907	8.90
1898	6.57	1908	8.01
1899	7.21	1909	8.51
1900	7.88	1910	8.98
1901	7.57		

The Bradstreet series is the only one that gives index numbers practically to date. All the index numbers show an advance of prices to 1907 as the high point, and a falling off in 1908. The Bradstreet table shows that the 1908 decline reached its low mark in June, and that the advance which set in then reached its high point January 1, of 1910. The average for 1909 exceeds that for 1908 by  $6\frac{1}{4}$  per cent. The advance represented by the high point of January 1, 1910, over the low mark of 1896, is sixty-one per cent; that the advance of the January 1 quotation over the average for the years 1892-99 is 36.3 per cent.

There is also the series published by the United States Bureau of Statistics of Labor, extending from 1890. Prior to 1890 the index numbers of the Aldrich report of 1893 furnish a record, running back to 1840. In examining these price records for the purpose of the present inquiry, it will be sufficient to go back only as far as the year 1890, since it is now possible to prepare our Composite Plot (see last section of this article) back only to said date. The index numbers compiled since 1892 by the United States Bureau of Statistics of Labor show the wholesale prices for each year from 1890. About two hundred and sixty commodities



## COMMODITY PRICES 1874-1911

The solid line is a plot of the American Prices, as determined by Bradstreet's Index, and the dotted line is a plot of the English prices as determined by the London Economist.

It is very noticeable that after the American prices are extremely high and the English prices have begun to decline, we usually soon witness a panic in the United States. Conversely, after the American prices are low and the English prices have begun to increase, the United States generally enjoys a period of prosperity.

are represented in this table. The base of the series is the average wholesale price for each commodity for the ten years 1890-99. The table on page 161 gives the index numbers of the Bureau for selected classes of commodities from 1890 through the last published report.

Among the foreign tables of distinct value are Sauerbeck's Index Table and the "Economist" Index Table. The following pertaining thereto was taken from the report on the "Cost of Living" prepared in May, 1910 for the Massachusetts Legislature. It is a very good explanation of these two indices.

The best record of British wholesale prices is the series compiled by Mr. Augustus Sauerbeck, published annually in the "Journal of the Royal Statistical Society." The tables include 45 articles. The base of comparison is the average price for the years 1876-77. In the following table the Sauerbeck prices for various commodities are given, the selection being made with a view to comparison with the American prices given in the United States Bureau of Labor reports:

SAUERBECK'S INDEX NUMBERS OF ENGLISH WHOLESALE PRICES, 1887-1908

Year.	Meat.		Wheat flour.	Butter.	Sugar.	Coffee.	Tea.	Potatoes.	Coal.	Leather.	Cotton.	Wool.	Average food.	Average all Commodities.
	Beef.	Pork.												
1887.....	72	83	61	82	52	113	53	73	73	94	62	72	..	..
1888.....	78	77	65	80	57	96	50	69	75	87	62	72	..	..
1889.....	78	85	63	82	69	114	50	69	80	84	66	82	75	72
1890.....	76	81	63	80	54	123	51	60	86	81	67	76	73	72
1891.....	80	75	72	85	57	118	56	79	86	81	52	70	77	72
1892.....	76	92	61	86	58	113	51	60	84	81	46	61	73	68
1893.....	78	96	54	85	62	123	53	56	89	81	51	60	72	68
1894.....	74	85	48	78	48	117	47	60	75	78	42	55	66	63
1895.....	74	71	50	74	43	115	47	68	68	84	43	57	64	62
1896.....	68	67	54	78	46	100	46	47	68	84	48	62	62	61
1897.....	72	85	65	75	39	86	45	61	72	84	43	59	65	62
1898.....	72	87	72	76	40	78	46	70	76	84	37	64	68	64
1899.....	80	77	58	82	44	75	50	60	84	84	40	83	65	68
1900.....	84	85	60	82	46	74	49	67	107	87	61	76	69	75
1901.....	84	94	58	84	38	67	40	67	91	87	53	62	67	70
1902.....	94	92	56	82	30	64	38	59	84	87	54	72	67	69
1903.....	84	85	59	80	36	63	41	72	75	87	67	78	66	69
1904.....	84	75	62	82	44	72	43	77	74	87	73	77	68	70
1905.....	80	88	62	86	47	74	40	56	70	84	57	84	69	72
1906.....	80	94	58	88	36	73	40	57	75	94	66	87	69	77
1907.....	84	87	63	86	39	67	47	75	90	97	73	88	72	80
1908.....	90	83	69	91	43	62	46	69	82	91	64	76	72	73
1909.....	90	94	75	90	45	67	47	56	80	93	70	87	73	74
Per cent increase over low point.....	32.4	40.3	38.9	15.4	-2.2	-33.0	2.2	19.1	17.7	10.7	45.8	40.3	17.7	21.3
Average, 1890-1899.....	75.0	81.6	60.0	80.0	49.0	105.0	49.0	62.0	79.0	82.0	47.0	65.0	68.5	66.0
Per cent increase over average, 1890-99.....	20.0	15.2	25.0	12.5	-8.2	-36.2	-4.1	9.7	1.3	13.4	48.9	33.8	6.6	12.1

The increase of the 1909 average over the average of 1890-99 is 12.1 per cent; the increase over the low point of 1896 is 21.3 per cent. These

THE UNITED STATES BUREAU OF LABOR INDEX NUMBERS OF WHOLESALE PRICES, 1890-1908

Year.	Meat.		Wheat flour.	Beans.	Fish.	Eggs.	Butter.	Milk.	Sugar.	Coffee.	Tea.	Potatoes.	Coal.	Shoes.	House Furnishings.	Lumber and Building Materials.	Average Cloth and Clothing.	Average Food.	Average all Commodities.
	Beef.	Pork.																	
1890	85.5	96.0	120.6	121.5	108.0	99.1	100.4	103.1	138.5	139.6	99.3	110.3	98.8	104.8	111.1	111.8	113.5	112.4	112.9
1891	98.8	101.1	125.6	134.9	113.8	110.0	116.1	104.7	100.9	127.3	99.2	154.9	101.3	103.5	110.2	108.4	111.3	115.7	111.7
1892	88.0	110.4	104.2	112.0	99.2	110.4	116.4	105.1	89.4	108.9	106.0	91.1	109.3	103.5	106.5	102.8	109.0	103.6	101.7
1893	102.1	148.5	89.3	119.2	102.2	114.5	121.3	100.4	97.2	131.2	101.7	134.5	109.9	100.9	104.0	101.0	107.2	110.8	106.1
1894	99.8	112.1	77.6	110.6	92.0	93.5	102.2	103.1	83.9	126.0	98.0	123.8	97.3	99.4	100.1	96.3	96.1	98.8	96.1
1895	100.0	97.6	84.4	107.2	98.8	102.0	94.5	99.2	85.7	121.2	95.1	86.7	86.8	98.7	96.5	94.1	92.7	94.9	93.6
1896	90.8	79.7	91.2	70.3	92.0	88.7	82.3	91.8	94.5	93.9	91.0	39.4	98.7	99.6	94.5	93.4	91.3	94.9	93.6
1897	106.8	81.8	110.1	62.6	88.6	87.5	84.1	92.2	92.6	60.4	98.6	65.7	103.0	97.2	89.8	90.8	91.1	87.7	89.7
1898	111.4	86.4	109.0	74.7	94.4	92.6	86.8	93.7	108.0	48.2	104.2	102.1	98.6	96.3	92.0	95.8	93.4	98.4	90.7
1899	116.6	86.4	87.0	87.0	90.4	101.6	95.8	99.2	111.3	46.0	109.8	37.6	96.5	90.8	95.1	105.8	96.7	98.4	101.7
1900	113.4	108.7	88.3	125.6	112.0	100.7	101.7	107.5	116.7	62.6	104.9	74.9	102.4	99.4	106.1	113.7	106.8	104.2	110.1
1901	110.3	127.0	87.4	131.3	108.0	106.7	97.7	102.7	104.9	59.4	100.4	113.0	102.4	99.2	110.9	118.7	101.0	105.9	108.5
1902	130.3	140.0	80.7	115.0	107.0	122.7	112.1	112.9	91.7	44.0	100.2	119.4	118.4	98.9	112.2	118.8	102.0	111.3	112.0
1903	110.7	130.4	97.1	135.5	122.6	133.2	108.7	112.8	96.4	42.0	86.9	195.2	136.5	100.2	113.0	121.4	106.6	107.3	113.6
1904	113.0	114.9	125.4	123.6	123.6	138.2	98.7	107.8	101.9	59.0	97.1	140.3	130.4	101.1	111.7	122.7	109.8	108.7	115.0
1905	116.9	117.0	122.2	128.8	126.4	138.2	112.8	118.3	102.2	63.4	94.2	86.7	130.2	107.4	109.1	127.7	112.0	108.7	115.9
1906	110.2	139.0	96.8	113.8	130.8	133.2	113.1	118.0	94.8	61.8	82.8	166.1	130.9	121.8	111.0	140.1	120.9	112.6	122.5
1907	127.1	141.2	108.6	106.4	128.3	142.2	128.5	131.4	97.6	50.1	81.0	98.4	136.1	125.9	118.5	146.0	126.7	117.8	129.5
1908	148.2	129.3	118.8	138.9	124.9	142.0	122.1	129.0	104.8	47.8	75.1	142.6	130.1	121.3	114.0	133.1	116.9	120.0	122.8
Per cent increase over low point.....	63.2	62.2	30.3	83.4	35.8	60.1	48.3	40.5	9.8	-20.8	-17.5	259.4	26.3	24.8	26.9	47.2	28.3	43.9	36.9



increases may be compared with the advance of 22.8 per cent in the American Bureau of Labor wholesale prices in 1908 over the average for 1890-99, and that of 36.9 per cent over the low point of 1896. It appears from this comparison that the rates of increase in the United States have been double those in England. It should be borne in mind, however, that, as the English and the American numbers were computed on different bases, the comparison is not conclusive. Corresponding commodities have been selected from the Labor Bureau and the Sauerbeck tables, so far as this is possible, in order to facilitate detailed comparisons. This could not be done, however, in all cases, because many commodities are listed in the Bureau of Labor tables which are not found in the Sauerbeck tables, and in other cases there is a different classification.

A general similarity in the course of prices in the United States and England from 1890 to the present time is shown by the tables. In both countries from 1890 to 1896 or 1897 prices fell; then they began to advance, and continued with slight interruption to rise for the next ten years. The earlier decline was somewhat more pronounced in the United States; also, the later advance was more rapid and extensive in this country, particularly in the case of food products. The particular commodities which show a greater relative increase in the United States, are: butter, which has risen three times as fast as in England; meat, which has increased twice as fast; potatoes and coal. Shoes have risen in the United States more than three times as fast as leather in England.

The depression that took place in the United States in 1903 and 1904, notably in food products, was not paralleled in England.

It may also be noted that, while in England the price advance was general for all commodities, the advance in food stuffs was somewhat less rapid than that for others. In the United States the opposite was true: food products rose more rapidly than other commodities. In England, food products were barely 5 per cent higher in 1908 than the average for the period 1890-99, and were actually 6 per cent below the high prices of the early 90's. In the United States, food products in 1908 were over 20 per cent. higher than the average for 1890-99, and were about 5 per cent. higher than the highest point reached in the early 90's. Of the individual food commodities, beef shows the largest rate of increase in both countries, being 16.7 higher in 1908 than the average of 1890-99 in England, and 48.2 per cent higher in the United States. It should be observed, also, that the average of food products is lowered considerably by the inclusion of sugar, coffee and tea, since these commodities all show substantial decreases in England, and the last two in the United States. The index numbers published by the London "Economist" take as a base the average price of the six years 1845-50, as 100. The index number is the total of all prices of 50 odd commodities, estimated on this basis. No allowance is made for the relative importance of different commodities.

LONDON "ECONOMIST" INDEX NUMBERS, END OF DECEMBER, 1890-1909

1890 .....	2,241	1902 .....	2,003
1891 .....	2,133	1903 .....	2,197
1892 .....	2,120	1904 .....	2,136
1893 .....	2,082	1905 .....	2,342
1894 .....	1,923	1906 .....	2,499
1895 .....	1,999	1907 .....	2,310
1896 .....	1,946	1908 .....	2,197
1897 .....	1,890	1909 .....	2,390
1898 .....	1,918	1910 (Jan.) .....	2,373
1899 .....	2,145	1911 (Feb.) .....	2,396
1900 .....	2,125		
1901 .....	1,948		
		Average, 1890-99 ....	2,040

The increase shown by the preceding table is somewhat greater than that indicated by the Sauerbeck figures. The "Economist" numbers show the low year in England to be 1897, instead of 1896. It should be remembered, however, that the "Economist" figures are for December 31 of each year. The increase, February, 1910, over the average price, 1890-99, is 17 per cent, and over the low point, 1897, 26.7 per cent, as contrasted with 12.1 per cent and 21.3 per cent, respectively, as shown by the Sauerbeck tables.

There also are other indices for other countries, and the "Labour Gazette" of the Canadian Department of Labour publishes for Canada a Price Index for 225 commodities. In Germany, Dr. A. Soetbeer's record of Hamburg prices extending to 1891 is usually quoted. For France the most complete table of prices is that given in the Aldrich report of 1893.

Although it is not in the province of this article to discuss the history of prices during previous years, nevertheless the following, taken from the abovementioned report, is a most useful summary of conditions in this country and abroad from 1840 to date. In preparing this table, the Aldrich and the Bureau of Labor index numbers have been combined for the United States, while the Sauerbeck numbers have been used for England.

The table given on page 164 shows the movement of American and English prices of all articles and of food stuffs.

The salient features of the movement of prices as shown in the tables herewith produced are interpreted in the above report as follows:

1. A drop in prices, 1840-43, due to industrial depression.
2. A rise to 1847, which may be connected with bad harvests and the Irish potato famine in the case of English prices, and a high tariff in the United States.
3. A fall to 1849, more pronounced in England than in the United States, traceable to repeal of the corn laws, crisis and depression in England, and to reduction of the tariff in the United States.
4. An advance to 1857, due to an increase of the gold supply following the California discoveries and general prosperity.
5. A drop in 1857 and 1858, caused by crisis and depression.
6. Great fluctuations of American prices during the early 60's on account of war and disturbance of the currency system by greenback issues.
7. A sharp rise of American prices to the high point of 1866, due to the causes already mentioned.

## RELATIVE PRICES IN GOLD

Year.	All Articles.		Year.	All Articles.	
	Aldrich Committee.	Sauerbeck.		Aldrich Committee.	Sauerbeck.
1840	116.8	103	1875	113.4	96
1841	116.8	100	1876	104.8	95
1842	107.8	91	1877	104.4	94
1843	101.5	83	1878	99.9	87
1844	101.9	84	1879	96.6	83
1845	102.8	87	1880	106.9	88
1846	106.4	89	1881	105.7	85
1847	106.5	95	1882	108.5	84
1848	101.4	78	1883	106.0	82
1849	98.7	74	1884	99.4	76
1850	102.3	77	1885	93.0	72
1851	105.9	75	1886	91.9	69
1852	102.7	78	1887	92.6	68
1853	109.1	95	1888	94.2	70
1854	112.9	102	1889	94.2	72
1855	113.1	101	1890	112.9	72
1856	113.2	101	1891	111.7	72
1857	112.5	105	1892	106.1	68
1858	101.8	91	1893	105.6	68
1859	100.2	94	1894	96.1	63
1860	100.0	99	1895	93.6	62
1861	100.6	98	1896	90.4	61
1862	114.9	101	1897	89.7	62
1863	102.4	103	1898	93.4	64
1864	122.5	105	1899	101.7	68
1865	100.3	101	1900	110.5	75
1866	136.3	102	1901	108.5	70
1867	127.9	100	1902	112.9	69
1868	115.9	99	1903	113.6	69
1869	113.2	98	1904	113.0	70
1870	117.3	96	1905	115.9	72
1871	122.9	100	1906	122.5	77
1872	127.2	109	1907	129.5	80
1873	122.0	111	1908	122.8	73
1874	119.4	102	1909	.....	74

8. A fall of American prices to 1869, following the war, English prices remaining comparatively stable during the decade 1860-70.

9. An advance of American prices, 1869-72, and of English prices, 1870-73, due to business activity and speculation.

10. A fall of both American and English prices to 1879, in consequence of the panic of 1873 and demonetization of silver.

11. A rise of American prices, 1880-82, following the resumption of specie payments and the improvement of business con-

ditions; English prices, after a slight rise in 1880, continued to fall to 1887, on account of prolonged depression.

12. A drop in American prices to 1886, due to railroad collapse, followed by slight recovery.

13. A gradual decline of American prices to 1897, brought about by currency agitation and depression; English prices also moving downward slowly to 1896, after a slight rise to 1891, produced by trade activity.

14. A rapid rise of American prices and slower advance of English prices to 1907, caused chiefly by depreciation of gold, with a temporary decline in 1900, caused by the Boer War.

15. Fall of both American and English prices, 1907-10, on account of panic and depression.

## *II. Statistical Factors Affecting Prices*

The discussion as to what factors influence prices is one upon which economists and statesmen have dwelt ever since there has been a science known as "Political Economy." Although most of our great economists believe that the increased production of gold is the principal factor, yet there are many able men such as Professor Laughlin, of the University of Chicago, and Paul Leroy Beaulieu, of the Sorbonne, Paris, who believe that the increased production of gold affects prices very little. From the study, however, which my organization has given to the question, we believe that Professor E. W. Kemmerer, of Cornell University, and Professor Irving Fisher, of Yale University, have most correctly diagnosed the causes of the raising of the general price level.

These men believe the increase in gold and credits, including bank deposits subject to check, and especially an increase in the velocity of circulation of money and credits, are most vital factors in raising the price level. Certainly one dollar circulating twenty times a year has the same effect as twenty dollars circulating only once a year or ten dollars circulating twice a year. Thus, doubling the rate of circulation may have the same effect as doubling the gold production. Although many political economists have written volumes on this subject, these factors have first been stated in a definite concrete form by Messrs. Kemmerer and Fisher. In fact, it is to these men that I am indebted for the following equation and tables upon which this section is based.

The work was originally explained in Professor Kemmerer's book on "Money and Prices," published by Henry Holt & Company, and appears in its latest form in Professor Irving Fisher's new book entitled "The Purchasing Power of Money," published by the Macmillan Company. The work of these writers, reduced to its simplest form, is as follows: The *Price* of produce and commodities is always equal to the *Money in Circulation*, multiplied by its *Velocity of Circulation*, plus *Credits*, multiplied by their *Velocity of Circulation*, divided by the country's *Volume of Trade*. Moreover, the more one reads on the subject of prices, the more he is convinced that all of the volumes, monologues and theses written thereon can be reduced to the above simple proposition.

Mathematically, P is obtained from the following formula:

$$M V + M' V' = P T$$

In this formula:

M = Money in Circulation

V = Its Velocity of Circulation

M' = Deposits Subject to Check or "Credits"

V' = Their Velocity of Circulation or "Activity"

T = Volume of Trade

P = Price Level

Therefore:

$$P = \frac{MV + M'V'}{T}$$

which shows that as the factors M and M', or V and V' increase, P also increases and the price level advances. As V is fairly constant, this means that the increased price level of to-day is practically due to the increase in money, M (including gold, bank notes, etc.), to the increase in deposits subject to check, M', and to the increased velocity of circulation of moneys and deposits. The increase in M'V' is largely reflected in the great increase in bank clearings.

A study of the annexed chart (for the use of which I am indebted to Professor Fisher and the Macmillan Company) shows that this formula can be most graphically designated by a picture of a "balance" for each business year. For instance, in the top balance on the chart, for the year 1896, M is illustrated by a bag supposed to contain \$880,000,000 or the amount of money then in circulation, and the distance at which said bag is hung

## GRAPHICAL ILLUSTRATION OF PROF. FISHER'S "EQUATION OF EXCHANGE"

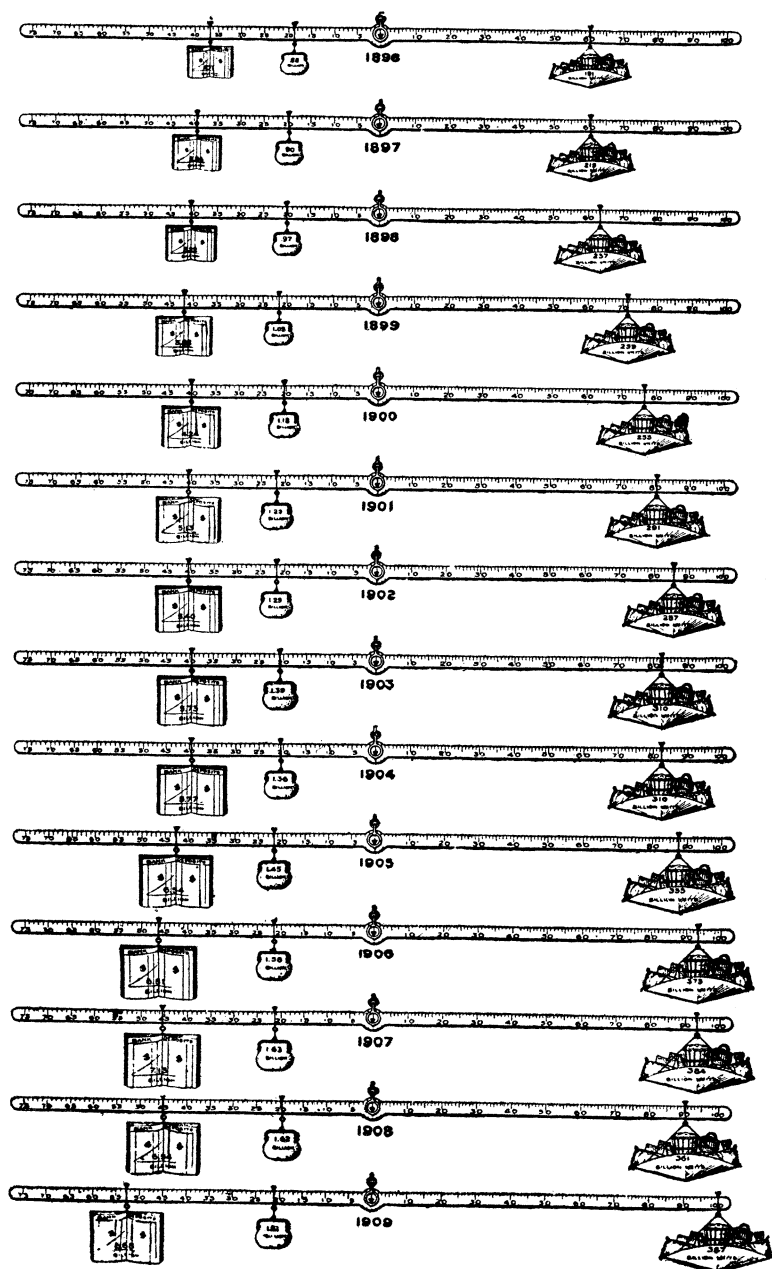


FIG. 17.

(Used by permission of Prof. Fisher and the Macmillan Company.)

from the pivot represents its velocity of circulation or  $V$ , which Professor Fisher finds to be nineteen times a year.

$M'$  is illustrated by a bank book showing the deposits subject to check, namely \$2,710,000,000 and the distance said bank book is hung from the pivot represents the velocity of said circulation or  $V'$ , which was thirty-seven times a year. The volume of trade is illustrated by a scoop hung from the right end of the balance representing \$191,000,000,000 worth of trade reckoned, not at the prices of 1896, but at the prices of 1909 which is the "base" year. (By reckoning the volume of trade of all years at the same prices—those of 1909—the scoop shows how these volumes of trade compare with each other *irrespective of the price level*.) *The distance of the scoop from the center, represents the price level or  $P$ , which is 60 per cent of the price level of 1909.* All these factors must be in equilibrium at any given time and if one is moved, one or more of the others must be adjusted to correspond. Therefore, as the conditions differ for each year, the pictures on the chart differ for each year and the changed conditions existing from 1896 to date are most graphically shown on this most interesting chart of Professor Fisher's.

Therefore, a glance at the distance of the scoop from the center shows how the price level has changed, while the other distances and weights graphically show the reasons therefor. The annexed chart does not show 1910 conditions; but the following figures are for 1910 and show that the "weights" on the left are about the same distance from the center as was the case in 1909, while the scoop is further from the center than ever.

$M$	$M'$	$V$	$V'$	$P$	$T$	$MV$	$M'V'$	$MV+M'V'=PT$
1.64	7.23	21	52.7	104.0	399	34	381	415 = 415

It might also be added that Professor Fisher's diagnosis for 1910 shows conclusively that the velocity of circulation of deposits *subject to check* is substantially the same in 1910 as in 1909 and much higher than in any other year, which is a disquieting symptom, indicating that our people are doing business on very low bank accounts compared with the expenditures which they are making.

When emphasizing the importance of this formula, I am always asked as to the figures used in working out the various factors. I will therefore describe in the briefest possible manner how

these figures are derived, supplementing the description with some tables from Professor Fisher's book on "The Purchasing Power of Money" and some additional figures prepared by my organization.

"M" is the estimated *Money in Circulation* in the United States, which includes coin and paper outside of the United States Treasury and banks of deposit and discount. The money in the United States Treasury is excluded because it is of no use to the merchants, and the bank reserves are excluded for the same reason. Although the following table, of course, is not absolutely accurate, yet it is made up from official statements and all government and other calculations are based thereon.

ESTIMATED MONEY IN CIRCULATION IN THE UNITED STATES (M)  
(In Billions of Dollars)

1896 .....	.87	1904 .....	1.37
1897 .....	.88	1905 .....	1.45
1898 .....	.96	1906 .....	1.59
1899 .....	1.03	1907 .....	1.63
1900 .....	1.17	1908 .....	1.63
1901 .....	1.22	1909 .....	1.63
1902 .....	1.26	1910 .....	1.64
1903 .....	1.38		

"M'", or the *Individual Deposits Subject to Check*, has been worked out especially for use in connection with this formula. The result is based on the figures for individual deposits, less the deposits in savings banks and in the savings departments of national banks. In fact, we are indebted to Mr. A. Piatt Andrew, Assistant Secretary of the Treasury and the expert of the National Monetary Commission for these figures, which show for the first time the actual *deposit currency* of the United States. The complete table is as follows:

ESTIMATED INDIVIDUAL DEPOSITS SUBJECT TO CHECK (M')  
(In Billions of Dollars)

1896 .....	2.6819	1904 .....	5.80
1897 .....	2.8019	1905 .....	6.54
1898 .....	3.1919	1906 .....	6.84
1899 .....	3.9019	1907 .....	7.13
1900 .....	4.2019	1908 .....	6.57
1901 .....	5.1319	1909 .....	6.75
1902 .....	5.4319	1910 .....	7.23
1903 .....	5.70		

To ascertain "V" is a work that cannot be briefly described,  
(487)



as many theses have been written on this subject of itself. A full detailed description thereof, however, may be found in the *Journal of the Royal Statistical Institute* for December, 1909, entitled "A New Method of Ascertaining the Velocity of the Circulation of Money." This method has been most favorably commented upon by the leading economists of the world, and we are justified in taking their word for its correctness. Practically the work consists of obtaining by mathematical formulas the actual velocity or circulation for 1896, which was 19, and for 1909, which was 22 and interpolating the intermediate years. This gives the following table for "V":

ESTIMATED VELOCITY OF MONEY CIRCULATION (V)

1896 .....	19	1904 .....	21
1897 .....	19	1905 .....	22
1898 .....	20	1906 .....	22
1899 .....	22	1907 .....	21
1900 .....	20	1908 .....	20
1901 .....	22	1909 .....	22
1902 .....	22	1910 .....	21
1903 .....	21		

Briefly, this means that a given piece of money circulates on the average about 22 times a year.

"V" is ascertained indirectly. After obtaining M, M' and V, it is a simple matter to obtain V', for the following reason:

"The velocity of circulation of bank deposits is found by dividing respectively the total check circulation (M'V') by the bank deposits (M'). The divisor, M', has already been found. As to the dividend, M'V', this is practically the total of checks drawn in a year, for we may reasonably assume that, on the average, each check circulates against goods once and but once."

Moreover, the work which has been done by Professor Kinley, of the University of Illinois, enables one to obtain this data directly. Professor Kinley's special investigation was based upon the value of the checks deposited on July 1, 1896, which was about \$468,000,000. To quote again: "If we could assume that this day was an average day of the year, we should need, in order to obtain the total year's deposits of checks, simply to multiply this by the number of settling days in 1896, which was 305. But it happens that July 1 is an exceptionally heavy day in the deposit of checks. Making allowance for this fact, as indicated by the clearings of the New York clearing house, we

conclude that the total year's deposits of checks in 1896 were about 97 billions, with a probable error of some 5 or 6 per cent. Similar calculations for 1909 make the total check transactions of that year 364 billions. We have thus the value of the total check circulation ( $M'V'$ ) in the two years 1896 and 1909; and find them to be 97 and 364 billions respectively, indicating a prodigious growth in thirteen years. We have still to interpolate figures for intervening years. For the period between these two years, we have, unfortunately, no such data as those of Professor Kinley for 1896 and 1909. However, we can find an excellent barometer in the clearing house transactions; a barometer dependent partly on the clearings in New York City, but more on those outside of New York City. It is well recognized that, although the clearings in New York deserve an exceedingly large representation, their relative importance in the total clearings is exaggerated."

As to what relative importance should be given respectively to clearings in New York and to the outside clearings in order to obtain the best barometer of the check transactions for the entire country, it has been concluded that, if the outside clearings be multiplied by five and the result added to the New York clearings, the result will be a good barometer of check transactions for the United States.<sup>1</sup> By means of this barometer of check transactions, consisting of New York clearings plus five times the

<sup>1</sup>Although New York clearings constitute two-thirds of all clearings for the country, it cannot be imagined that the check transactions in and about New York form two-thirds of the check transactions of the United States. We have already seen that the reported check deposits in New York on March 16, 1909, amounted to 239 millions. This figure, being for New York, is probably nearly complete and indicates, as we have seen, an estimated average for the daily deposits in New York City in 1909 of 306 millions. This gives  $306 \times 303$  or 93 billions for New York City, for the entire year. Our estimate for the entire country was 364 billions, leaving 271 billions outside of New York City. Let us compare these estimated figures for check deposits with the figures for clearings. The New York clearings in 1909 amounted to 104 billions and those outside New York, to 62 billions.

The New York clearings (104) thus exceed the New York check deposits (93), probably because the clearings on account of outside banks include clearings representing banking transactions as distinguished from commercial transactions, since New York City is the chief central reserve city. The New York City deposits were thus only  $\frac{93}{104}$ , or about 90 per cent of the New York clearings. Outside of New York, on the other hand, the deposits far exceeded the clearings, being in the ratio  $\frac{271}{62}$  or 4.4. These ratios between check transactions and clearings, viz., .90 for New York and 4.4 for "outside," would indicate that the published figures for clearings should be weighted in the ratio of 4.4 to .9 or about 5 to 1. That is, on the basis of 1909 figures, five times the outside clearings plus once the New York clearings should be a good barometer of check transactions.

outside clearings, and a knowledge of the actual check transactions in 1896 and 1909, one may easily derive from the "barometer" an estimate of the actual check transactions. The result is as follows:

ESTIMATED CHECK TRANSACTIONS (M'V')  
(In Billions of Dollars)

1896 .....	97	1904 .....	233
1897 .....	106	1905 .....	282
1898 .....	127	1906 .....	320
1899 .....	166	1907 .....	320
1900 .....	165	1908 .....	300
1901 .....	208	1909 .....	364
1902 .....	222	1910 .....	381
1903 .....	223		

Having obtained estimates of M'V' and having previously obtained estimates of M', it is easy, by simple division, to obtain V'. The results are as follows:

ESTIMATED VELOCITY (V') OF CIRCULATION (BY CHECKS) OF DEPOSITS  
SUBJECT TO CHECK

1896 .....	36	1904 .....	40
1897 .....	38	1905 .....	43
1898 .....	40	1906 .....	47
1899 .....	43	1907 .....	45
1900 .....	39	1908 .....	46
1901 .....	41	1909 .....	54
1902 .....	41	1910 .....	52.7
1903 .....	39		

We have now, as will be seen, determined M and M' and V and V', thus leaving only one factor to be determined, namely, the Volume of Trade, or "T". This has been ascertained by the most careful research work and the data reduced to a common index number for each year as given in the following table which represents the volume of trade in billions of dollars as reckoned at the prices of 1909:

ESTIMATED VOLUME OF TRADE

1896 .....	209	1904 .....	324
1897 .....	239	1905 .....	378
1898 .....	260	1906 .....	396
1899 .....	273	1907 .....	412
1900 .....	275	1908 .....	381
1901 .....	311	1909 .....	399
1902 .....	304	1910 .....	399
1903 .....	335		

These index numbers for "P" are based on the data for 44 articles of internal commerce, 23 articles of import and 25 articles

of export. Sales of stock, railroad freight carried, and letters mailed through the post office are also included. In short, the increase in "T" practically coincides with the increase in our line of growth on the composite plot. For instance, on the above table it will be seen that the index figures for the volume of trade increased 18 per cent from 1893 to the present time which corresponds to a similar per cent grade of our line of normal growth.

We now have figures for all factors in the equation, and to ascertain the price level at any given time, it is necessary only to bring these figures up to date, using the above figures in the formula, and the price level, or "P", is apparent. But this formula is not based simply on the theory that the prices of commodities are and will be dependent on these five factors; but the formula can be absolutely demonstrated, which is what Professor Fisher has done. For instance, the following table gives the index number of general prices based on figures prepared by the Bureau of Labor at Washington and after "P" has been worked out independently by the above formulas for the various years from 1896 to 1910 inclusive, the results will be found to compare almost exactly with the index numbers for "P" as given in this table.

INDEX NUMBERS OF GENERAL PRICES

1896 .....	63	1904 .....	85
1897 .....	64	1905 .....	91
1898 .....	66	1906 .....	96
1899 .....	74	1907 .....	97
1900 .....	80	1908 .....	92
1901 .....	84	1909 .....	100
1902 .....	89	1910 .....	104
1903 .....	87		

The above table is based on the figures of the Bureau of Labor for wholesale prices; its only difference from the Bureau of Labor figures is that the above index numbers include prices of securities and wages. When it is considered that in no case have any of these factors, including the above index numbers, been changed more than two or three per cent, in order to demonstrate the formula, there can be no doubt but that *the prices of commodities are dependent upon the money in circulation multiplied by its velocity plus the credits multiplied by their velocity divided by the volume of trade*. Therefore, whatever may be written relative to factors affecting prices and however we may be criticised for endeavoring to reduce these factors to a concrete formula, I am

nevertheless convinced that the formula is correct and that all contradictory work is fundamentally wrong. *If so, the factors affecting prices are self evident.*

### III. *General Factors Affecting Prices*

Although the above formula shows clearly the cause of raising the price level as a whole throughout the world, yet I recognize that there are other factors affecting the price of certain commodities and of certain products. Moreover, there are other factors which make the prices different in different localities. Among these factors may be mentioned the changes in expenses of production, tariffs and taxation, wages and unionism, changed agricultural conditions, monopolies and "Trusts," general extravagance, competitive advertising and speculation. These factors are not the factors which raise the price level as a whole and are not fundamental factors; but are factors to consider when referring to different figures in different localities. Instead of preparing more original matter on this point, I herewith quote again from the report of the Massachusetts Legislature (House Document, No. 1750) and also give some extremely good comments on the most important of these factors by well-known men.

The following table presents an analysis of the causes assigned for the increase of prices by the writers of thirty articles that have appeared in print since January 1, 1910:

Causes.	Number of Articles Written Therein.	
	Principal Cause.	Contributory Cause.
1. Increase of gold supply.....	17	4
2. Exhaustion of natural resources.....	4	8
3. Rising standard of living.....	2	3
4. Withdrawal of population from agriculture, and growth of cities.....	2	1
5. Trusts and combinations.....	2	10
6. Tariff.....	1	7
7. Labor unions.....	1	3
8. Growth of population, and unscientific methods of farming.....	1	4
9. Extravagance in expenditure.....	..	6
10. Waste and fraud in distribution.....	..	5
11. Uneconomical marketing and housekeeping....	..	3
12. Speculation.....	..	3
13. Immigration.....	..	2

"The figure given in the first column of the table, under the head 'Principal Cause,' indicates the number of writers who assign the chief importance to the factor in question; that given in the second column, 'Contributory Cause,' shows the number who regard the influence of the cause enumerated as secondary. It appears that seventeen out of the thirty writers attribute the advance of prices mainly to the increase of the gold supply; four others regard this cause as of secondary importance. Exhaustion of natural resources, resulting in diminished returns from agriculture, increased expenses of production and pressure of population on the land, is given the first place by four writers; eight others ascribe secondary importance to this factor. A rising standard of living is believed to be the primary cause of higher prices by two of the contributors of the recent discussion; three others assign some weight to this influence. Withdrawal of population from agriculture, and growth of the cities, which are both consequences of the concentration of population, are regarded as the main factor by only two writers, and as a secondary cause by one. The growth of population in general, combined with unscientific methods of agriculture, resulting in disproportion between the population and the food supply, is selected as the first cause by one observer; this cause is given secondary importance by four others. Two writers place the responsibility chiefly upon the trusts and combinations, and ten others assign more or less importance to this cause. The tariff is assigned as the primary cause by only one writer, but is held to be a contributory influence by seven others. Similarly, the influence of labor unions is declared to be the chief cause by one person, and is mentioned also by three others. The foregoing are the only influences that are regarded as chief factors in the advance of prices; the others are regarded by all the writers as of secondary importance, in varying degrees."

The manner in which the chief causes are assumed to operate in bringing about an advance of prices is set forth in the following extracts from the papers summarized in the preceding table:

#### *1. Increase of Gold Supply*

To say that the present high prices are due to trusts will not explain the similar rise of prices in cases where there are no trusts in those particular commodities in this country, or no trusts at all in other countries where the rise of prices is also well marked. To say that high prices are due to the tariff does not explain the similar rise of prices in England, where there is

no protective tariff. To say that high prices are due to labor unions or to the associated action of labor does not explain the rise of prices in the Orient, where there are no labor unions. To say that rising prices are due to the growth of population does not explain the falling prices of a decade ago, when population increased at virtually the same rate. During the free silver agitation the favorite argument of men like Mr. David A. Wells was that falling prices were due to the progress of invention. Yet the progress of invention has continued unabated during the past twelve years, and yet prices have risen instead of falling. It is obvious, then, that apart from the minor oscillations in any one commodity a general change in the level of prices can be explained only by a cause which attaches equally to all prices. Now, price in general is value expressed in terms of money; hence a general change in the price level means a change in the value of money. But the value of money, like the value of everything else, depends on the relation of the supply of money to the demand for money. From the point of view of supply the answer is easy. The standard of the civilized world is now, and has been for some time, gold. . . . Gold, in other words, is being turned out in such enormous quantities that it is falling in value. But a fall in the value of gold, other things being equal, is tantamount to a rise in general prices. (Prof. E. R. A. Seligman, Columbia University, in "Journal of Commerce and Commercial Bulletin," January 3, 1910.)

### *2. Exhaustion of Natural Resources*

We have begun to feel this land crowding effect. Agriculture on the average has begun to grow more intensive. If inventions and discoveries of the future are to annul or reverse this effect, they must be of a different kind from those that have given us our seeders, reapers, threshers, etc. We shall need thereafter, not something that will enable a man to till more acres, but something that will enable him to get greater and greater returns from a single acre. We have reached the beginning of the period of increasing intensiveness of agriculture, and by one of the cardinal laws of economics that process means a diminution of the per capita returns. Labor creates and gets less and less, all other things remaining the same, when it tills each acre more and more laboriously. (Prof. John Bates Clark, Columbia University, in the "Independent," March 10, 1910.)

### *3. Rising Standard of Living*

Ordinary explanations, such as the tariff, the trusts, the unions, etc., fall short of satisfying the observer who takes a broad view of the situation. These agencies may in a measure contribute, but the controlling cause lies deeper; it is, in fact, within ourselves. Food, shelter, clothing, education and society are five necessities of civilized existence. Are we now content with the same quality and quantity of any one of these requirements that satisfied us in previous times? . . . The spread of popular education has brought about a decided and general advance in the standard of living, affecting every class of society. . . . In all the five principal items of the working-man's cost of living, his demands and the demands upon him have largely increased. In the middle classes the general increase in desires as to food, homes, clothing, education and society has been more marked, while among the wealthy there has been a significant growth in the indulgence of extravagant tastes in every direction; the result is a demand, hitherto unequaled, for all classes of luxuries. This leads up to the heart of the situation. Prices are established by the relation of the supply to the demand; production in this country, while steadily increasing, has not kept pace with the vastly enlarged demand brought on by the rapid growth of the desires of all our people. To this cause in largest measure

may be traced the conspicuous rise in the cost of living. Of course tariffs have their influence in artificially accentuating the short supply of certain commodities in various localities; trusts and labor combinations are also factors; but these are small items compared to the great underlying cause, namely, the change within ourselves,—our greater needs, our broader desires for the necessities, the comforts and the luxuries of life. When the supply of commodities is increased so as to keep pace with our demands, or when our demands are restricted to present production, the prices of items making up our cost of living will be reduced. (Marcus M. Marks, President National Association of Clothiers, New York, in the "Delineator," April, 1910.)

#### 4. *Withdrawal of Population from Agriculture, and Growth of Cities*

There are many reasons to account for the increased cost of living. The number of persons growing wool and cotton and leather, and those devoting themselves to the growth of wheat and meat and vegetables, while increasing in actual numbers, is decreasing in proportional numbers. Thus the consumer is rapidly gaining in numbers on the producer. This it may be said, is compensated for by the increased efficiency of the producer. It requires less labor, for instance, at the present time to produce a given unit of raw materials than in former years. It is true that labor-saving machinery has done much, but the fertility of the soil has diminished because of a lack of sufficient knowledge of the proper methods of its conservation. The labor, likewise, is greatly increased in price; so I take it that the initial cost of production is greater now than in former years. This, together with the increased demand, has produced a natural increase in prices which cannot be corrected unless the relations existing between the producer and consumer are changed. It is not likely that this will take place; on the contrary, owing to the difference in methods of living and the attractions which gregarious life has for the human race, there will be, in my opinion, even a greater disproportion existing between consumer and producer. This is offset to a certain extent by the fact that consumers, especially those who reach a competence, are almost universally in their older days possessed with a desire to return to the soil and indulge in the production of the necessities of life. This return to the soil, though, does not by any means compensate for the exodus from the soil to the city. (Dr. Harvey W. Wiley, Bureau of Chemistry, Department of Agriculture, symposium in the "Delineator," April, 1910.)

#### 5. *Trusts and Combinations*

As a general proposition, it is true that no general economic condition is due to any one cause. The industrial trust has, however, had a very important influence in bringing about the increase in the cost of the necessities of life; for these combinations have in effect repealed the law of supply and demand and done away with the old theory that "competition is the life of trade." A concrete example will serve as an illustration. In 1896 oil was selling in St. Louis, Mo., for 6½ cents a gallon. Ten years later, at the time I instituted suit in the name of the State of Missouri against the Standard Oil Trust, it was selling for 9½ cents a gallon. During this period the production of crude petroleum throughout the country had almost doubled, with a consequent decrease in price, while the production in the Kansas and Oklahoma oil fields had increased from 81,000 barrels in 1901 to 12,000,000 barrels in 1906, and its price had declined from \$1.20 a barrel in 1901 to 40 cents a barrel in 1906. The competition made possible as a result of this litigation brought about a reduction in the price of oil in the State of Missouri from 9½ cents in 1906 to 6½ cents in 1908. (Herbert S. Hadley, Governor of Missouri, in the "Delineator," April, 1910.)



6. *Tariff*

In my judgment, the causes are to be found, not in cheapened gold, but in the forces increasing the expenses of production of goods. The first of these is the high rate of taxation imposed by the Dingley tariff act of 1897 and continued by the tariff act of 1909. The price of goods affected shows marked decline after the panic of 1893 and the passage of the Wilson act; then, after the passage of the Dingley act there followed a portentous rise of prices, *e.g.*, blankets, hosiery, shirtings, woolen suitings, overcoatings, sheetings, worsted yarns, women's dress goods, lumber, zinc, axes, files, door knobs, etc. The most serious effect of the tariff was the increased cost of wool and of the various materials of manufacture, whereby the prices of the goods using these materials were raised far higher than the mere rise in the cost of materials, since finished goods received compensating duties for the raw materials and abundant protective duties besides. The National Association of American Manufacturers is to-day agitating for a lower tariff, especially on materials, because our manufacturing costs make it impossible to compete with other countries in foreign markets. (Prof. J. Laurence Laughlin, University of Chicago, in the "Delineator," April, 1910.)

7. *Labor Unions*

There is general complaint about high prices of the necessities of life, various reasons being assigned for the same, chief among which are the tariff and the capitalistic trusts; while as a matter of fact the primary cause of the constantly advancing prices of commodities of all kinds lies at the door of the labor trust, a cardinal principle of which is to raise wages and restrict production, neither of which can fail to diminish the purchasing power of the dollar, and when working together they doubly depreciate its value. Therefore, just as long as the labor trust is permitted to interfere with the law of supply and demand by restricting production and artificially advancing cost of commodities by abnormally high wages, just so long will our industrial affairs remain in a state of chaos and unrest, and just so long will that great portion of the public who cannot unionize be compelled to suffer the consequences. Why not strike at the root of the evil, and put the labor trust out of business first, instead of helping it on toward its "goal," as some well-intentioned men are blindly doing? (John Kirby, Jr., President National Association of Manufacturers, New York, in the "Delineator," April, 1910.)

8. *Growth of Population, and Unscientific Methods of Farming*

The growth of population, which is simply another name for increased consumption, has overtaken production of food-supplying cereals and meats; and as the converging lines of production and consumption approach each other, prices must advance. . . . I doubt if any country in the world excels the United States in natural fertility of soil, or has a more favorable general climate; but with our careless, uninformed methods of seed selection, fertilization and cultivation, our farms produce an annual yield of less than 14 bushels of wheat per acre, as compared with 32 in England, 28 in Germany, 34 in the Netherlands and 20 in France. The United States produces something less than 23 bushels of oats per acre, while England produces 42, Germany 46 and the Netherlands 53. Potatoes, with wheat and corn, are a food staple of the poor man. Germany, with an arable area of less than some of our largest states, produces more than seven times the number of bushels of potatoes that are produced in all the states. The increased value of corn, wheat, oats and barley in the United States, provided the average yield per acre of the same crops in Germany had been raised, and assuming a production of 50 bushels of corn to the acre, would have amounted to three and one-quarter billion dollars for the crop for

1909; and undoubtedly this increased production of grain would have enabled this country to have held the first place as a meat-exporting nation, which we have been compelled to surrender to Argentine. If population and consumption increase in the future as rapidly as they have during the last ten years, and production per acre of our farms is not greatly increased, within five years from the present, or before 1915, this country will have ceased to be a food-product-exporting nation; and within ten years we shall be importing more grain and meat per annum than we have ever exported in any one year for an average of five years, in our history. What will be the cost of living, under these circumstances? (W. C. Brown, President New York Central Lines, in the "Delineator," April, 1910.)

Personally I am very much interested in this subject of "The Depletion of the Soil." Many are well acquainted with the study which Mr. J. J. Hill has made relative to this special topic and the warnings which he has continually given; but it is very certain that the country as a whole has not begun to realize the importance thereof. In short, next to the increased production of gold, the "Depletion of the Soil" is a very important factor in causing the present high cost of living and influencing commodity prices.

We have not the exact figures, but I understand that chemists estimate that about twenty per cent of the value of each year's crop should be used for fertilizing the next year's crop. In other words, about twenty per cent of what comes from the soil should go back to the soil. Of course, these details are for the chemist to discuss, rather than the economist; but the general subject is of great importance to all. Of course, a proper proportion of that part of our crop which is consumed on the farms and rural districts, is now returned to the soil; but all that remains of the great portion consumed in our cities enters the sewers and eventually finds its destination in the sea, and consequently is lost so far as immediate practical value is concerned. In fact, it has been estimated that about \$2,000,000,000 a year is wasted through the sewers. In other words, to replace the values of the refuse passing through our sewers, by purchasing fertilizer at current market prices, would cost \$2,000,000,000 a year.

#### *IV. How Commodity Prices May be Forecast*

This in reality is a subject by itself, and thus is difficult properly to treat in so short a space. However, as the average man is much more interested in the present and future than in the past, I cannot close without giving a brief description of the very important work which is now being done along the line of forecasting commodity prices.

Up to within the last few years, economists have been divided into two "schools," when discussing the course of future prices. One school has considered simply the element of time, believing that there is a periodic rhythm in the course of prices and that a period of low commodity prices comes approximately every so many years. They believe that this period is—within a certain number of years—again followed by another period of high prices, and so on. Believers in this theory, however, disagree as to the length of the periods. Although all unite that the major period is approximately twenty years, the length of the average business generation, yet they differ as to the duration of the minor cycle, some believing that a period of low prices comes every five years, some every ten years, and some at still different rates. The fact that these men differ so as to the duration of said period of time is, to my mind, one reason why they are wrong in their assumption. In fact, I strongly believe that there is no economic basis for the statement that prices of commodities must rise and fall according to any period of time basis.

The other school bases its prognostications on the theory that price movements are due to the intensity of the period;—to wit, that prices will continue to increase until they reach a certain height, when prices will then decline. They believe that the decline will continue until prices reach a certain low point, when prices will again begin to increase. Their reasons are very plausible, claiming as they do that the high point is reached when prices exceed their value and usefulness to the commodity, and the low point is reached when the price is equal to or less than the cost of production. On analyzing these reasons, however, they will be found to be very superficial, as the value is an indeterminable quantity, and the cost of production is very variable.

It might be said that the men who believe that everything is regulated by supply and demand also come under this heading; but the terms "supply" and "demand" are very indefinite and mean nothing of themselves. In fact, if one of these "supply and demand men" is asked to name the causes of the supply or the causes of the demand, he immediately places himself directly into one of these two "schools" of thought. Therefore, it may fairly be said that, up to the present time, most students of fundamental conditions have been divided into these two schools, one basing their prognostications on the factor of time and the other on the factor of intensity, or, in

this case, prices. Neither of these two schools of thought has true economic reasons for their theories, and this doubtless is why said theories have failed to demand more serious consideration.

In more recent years, however, there has developed a third school of thought which bases its prognostications on what is known as the "area theory." This area theory considers both the factor of time and the factor of intensity, or prices. Their prognostications of prices are based on the product of these factors of time and prices, or, in other words, on the area consumed.

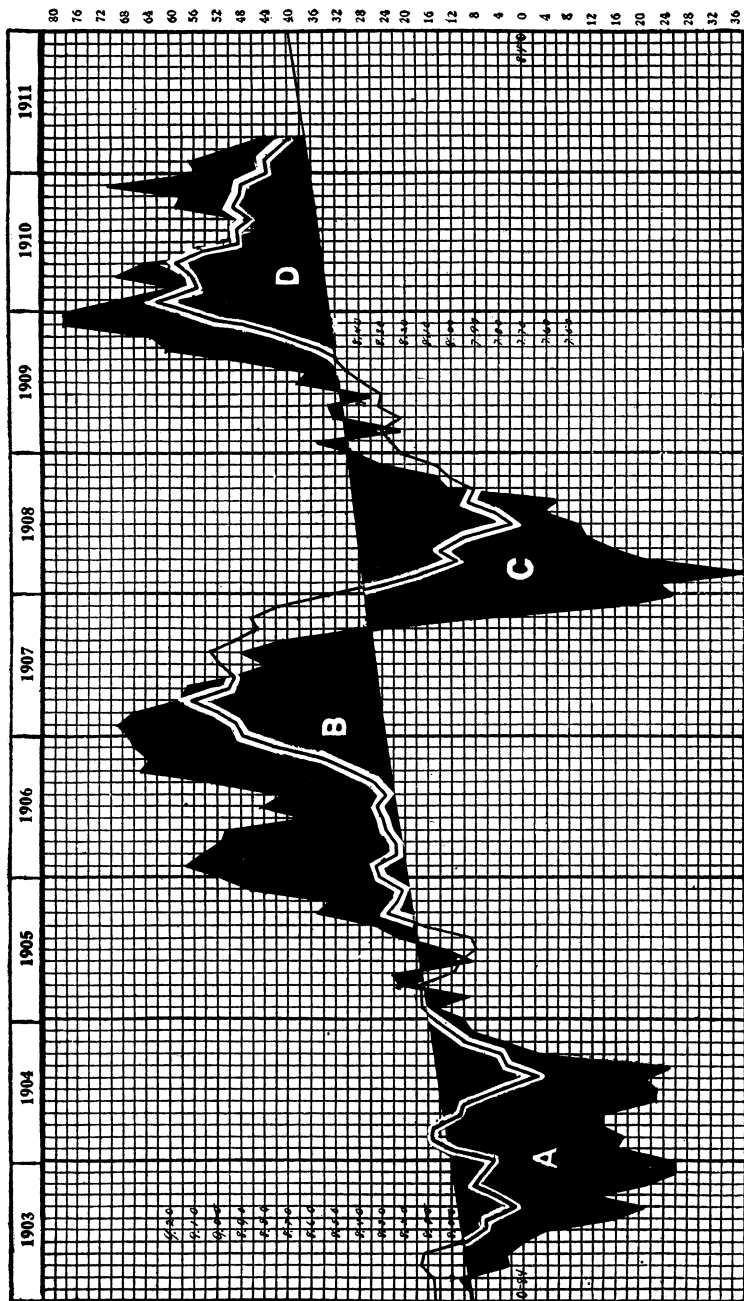
In short, this new school draws an oblique line, with a slope based on the normal increase in the nation's volume of trade, possibly somewhat as represented by "PT" or by "T" in Professor Fisher's formula. Starting at a time when the business of the country is practically normal, such as early in 1903, actual business conditions are plotted from month to month. This gives certain areas below and above this line of normal growth, and these areas are designated on the annexed plot as A, B, C, and D. In order to plot business conditions from week to week, the following twenty-five subjects are considered and combined under twelve headings: (1) Building Construction, (2) Money in Circulation, (3) Comptroller's Reports, (4) Loans of the Banks, (5) Cash held by Banks, (6) Deposits of Banks, (7) Surplus Reserves of Banks, (8) Total Bank Clearings, (9) Bank Clearings excluding New York, (10) Stock Exchange Transactions, (11) New Securities, (12) Business Failures, (13) Labor Statistics, (14) Imports, (15) Exports, (16) Balance of Trade, (17) Gold Movements, (18) Foreign Money Rates, (19) Political Factors, (20) Production of Gold, (21) Commodity Prices, (22) Crop Conditions and Iron Production, (23) Railroad Earnings, (24) Idle Car Figures, (25) Political and Social Statistics. The twelve headings are:

#### MERCANTILE CONDITIONS

Bank Clearings.	Failures.
Immigration.	New Building.

#### MONETARY CONDITIONS

Domestic Monetary Conditions.	Foreign Monetary Conditions.
Surplus Reserve.	Commodity Prices.



COMPOSITE PLOT OF THE SUMMARY FIGURES FOR AMERICAN BUSINESS CONDITIONS.

NOTE: The large black areas are formed by combining and plotting figures for the past nine years on New Building, Crops, Clearings, Iron Production, Money, Failures, Idle Cars, etc., in order to give a Composite Plot of actual business conditions in the United States. The line XY represents the normal growth of the country's business, the slope being changed whenever there is a change in the trend of conditions as shown by clearings, etc. Based on the economic theory that "action and reaction are equal" when the two factors of time and intensity are multiplied to form an area, the sums of the areas above and below said line of normal growth XY must, over a sufficiently long period of time, be equal, provided the line XY is properly located and enough subjects are herewith included, with all properly weighted and combined. Moreover, owing to the law of averages and certain psychological laws, these separate areas tend to be equal *in area*, although not necessarily in shape. Thus before there is another panic or depression (which will cause another area to be formed below the line XY) the area D will expand to approximately the size of the average of areas "A," "B," and "C." It, however, should be remembered that this next area (which will be called "E") may be of an entirely different shape from anything heretofore witnessed and still contain a similar area, according to whether there is to be a panic or simply a gradual liquidation. Knowing that the areas tend to be equal, one can always estimate the length of any period by watching each week its height, or "rate of flow," which shows how rapidly it is being consumed. The solid black line represents Bradstreet's Index numbers for Commodity Prices. A study of this line shows that a high point of commodity prices has come when the prosperity area is about two-thirds consumed, and the low point has come when the depression area is about two-thirds consumed, although this does not work out well in the case of area "D" as the Bradstreet's Index contains cereals which declined in price during 1910 owing to the extraordinary favorable weather conditions. To use this Composite Plot in connection with one's own business, the observer should plot his own sales thereon and note what portion of the respective areas has been consumed when his own sales were greatest or smallest. When using this plot for other purposes, it should be remembered that it refers to the *minor* cycles and not to the *major* cycles.

## INVESTMENT CONDITIONS

Prices of securities and shares traded in on the New York Stock Exchange.

Condition of Leading Crops.  
Political Conditions.

Railroad Earnings.

After obtaining such data each week, the latest figures on each subject are reduced to index figures, on the same principle that the London "Economist" reduces the prices of a number of different commodities to one common index figure. This index figure is a sort of "barometric index" showing, each week, the general business conditions throughout the entire country. By systematically plotting each week this barometric index number one has the outline of a plot that shows graphically general business conditions as determined by fundamental statistics.

In the plot reproduced herewith the large black areas—A, B, C, and D—are the result of such an outline obtained in such a manner and representing the past seven years. This is known as the Composite Plot of Business Conditions. This Composite Plot shows, first, the business conditions existing to-day compared with any other time since 1902; and, secondly, based as it is upon the law of "action and reaction being equal when the total force involved is considered," it indicates how much longer present conditions are to last.

This Composite Plot, therefore, shows merchants the actual conditions existing at any given time and, on the assumption that these areas tend to be equal in area, not in shape, it aids them in forecasting future conditions by showing whether the next area may be expected above or below the line of normal growth and about how long before it will come. Of course, this third school simply combines the work of the two former schools, as such men consider both time and prices, instead of simply one of these two factors. On the other hand, a little thought shows how reasonable is this third theory and how it automatically adjusts itself to conditions the same as a "governor" on an engine. For instance, if prices increase twenty-five per cent above normal, it is not reasonable to think that they will continue to go up until they reach the last previous high price of one hundred per cent, irrespective of the time consumed, but

it is reasonable to suppose that after prices have held this increase of twenty-five per cent for a period of four times as long as they had when selling at the previous high advance of one hundred per cent, that the time has arrived when logically they should fall.

In other words, the theory is that business conditions, as a whole, can continue with "the throttle one-fourth open" about four times as long as with the throttle wide open; or, to word it another way, when conditions are "doubly prosperous," said prosperity can last only one-half the period of time that it would if conditions were only moderately prosperous. This school believes that if the country would be willing to run along at a normal rate of speed so that the line for actual business would correspond with the line of normal growth, we would always have moderately prosperous conditions with a steady, slow advance. On the other hand, the higher that the line for actual business rises above the line of normal growth, the shorter length of time prices will remain high and conditions abnormally prosperous.

The preparation of this Composite Plot of Business Conditions, however, is simply the first step, or the basis, of this most recent and hopeful work relative to forecasting commodity prices. After preparing this Composite Plot, the next step is to plot thereon the average prices of the respective commodities in order to ascertain the relation between the prices of a given commodity and this Composite Plot. This work is now being done by a number of organizations in different parts of the country, and most wonderful results are being obtained. The first work performed was to ascertain the relation of the bond market to the Composite Plot, and it has been found that the lowest money rates and the highest bond prices have come at the very beginning of a prosperity area, as the line for actual business conditions has been crossing the line of normal growth; while the highest money rates and the lowest bond prices have come at the beginning of a depression area, directly after the line for actual business conditions has crossed the line of normal growth. When forecasting the average of thirty-two active stocks by the Composite Plot, it has been found that the high point of the stock market has come when the prosperity area is about one-fifth or one-fourth consumed, and the low point of the stock market has come when the depression area has been about one-fifth or one-fourth consumed.

In the same way the commodity market is now being forecast, and the annexed Composite Plot, above referred to, also contains a line showing the fluctuations in commodity prices since 1902. This line is based on Bradstreet's Index and runs from a minimum point of \$7.75 to a maximum of about \$9.25. Although the work has not continued over a sufficiently long period of time as yet to deduce an actual law, yet the opinion of many students at present is somewhat as follows:

*Prices of commodities are highest when the period of prosperity is approximately two-thirds consumed, and prices of commodities are lowest when the period of depression is about two-thirds consumed—that is, prices reach their high point in the latter part of a prosperity area and continue to decline well into the depression area, when they again begin to advance. When the prosperity area is shallow, prices will continue firm for a much longer period of time than when the prosperity area is high, and vice versa.*

Of course, the annexed plot does not show this conclusively because Bradstreet's Index number includes certain commodities which are subject to weather conditions and which should be eliminated. When these commodities are omitted and a line of general manufactured articles is considered, this law has thus far been found to be true. If future investigations likewise confirm this law, certainly the Composite Plot will be a most wonderful aid to all manufacturers and merchants. Heretofore the business man has either followed one of the two above mentioned "schools of thought" or else guessed, and thus in most cases has found himself mistaken. If the law above mentioned is true, hereafter the business man need simply to watch this Composite Plot each week, noting its development and, by the use of the above mentioned law, know approximately when to expect a turn in commodity prices. If the area develops slowly, he may know that it will be some time before the prices of commodities change, and he may base his commitments in accordance therewith. On the other hand, if the prosperity area develops very rapidly, as was the case in 1909, he may know it will be comparatively short and should plan his business on the assumption that commodity prices will soon decline. Thus, by watching the growth of this area from week to week, manufacturers and



merchants may forecast with wonderful accuracy the probable course of commodity prices.

As suggested, certain products and commodities must be treated independently, and I refer especially to such products as cotton, corn, wheat, and, of course, flour, the price of which is dependent thereon. Although the Composite Plot should be considered even when studying the probable future price movements of these products, yet the most potent factor is the weather. As to the study of the weather conditions, this is a subject by itself and cannot be discussed here. It may, however, be stated that the best reports of weather conditions may be obtained from the government, which work is fully explained in my book entitled "Business Barometers." Men who are interested in wheat, corn, cotton, oats, and such other commodities, as are reported at regular intervals by the Department of Agriculture, should very carefully study these government reports, although, of course, such reports should be supplemented either by personal inspection or by the reports of private correspondents.

There is also another feature which should be mentioned. This is that, although certain subjects like the price of pig iron can of themselves be forecast by studying the Composite Plot, yet it is unwise to consider the price of any one article independently. The safest method is to study the average of a large number of similar commodities. This has been most thoroughly discussed in connection with my writings on forecasting bond prices. When charting on the Composite Plot the price of one issue, this may or may not coincide with the general law; but when combining the prices of a number of bond issues and plotting the average price, the result is almost always in accordance with the law above mentioned. Therefore, with these two partial exceptions, it is believed that a law has now been obtained whereby the average price of commodities may be forecast through the use of this Composite Plot.

Of course, this entire work is in its infancy at the present time. The Composite Plot herewith annexed is simply based on comparatively few subjects while a great many more subjects should be included. It also is a debatable question whether or not the subjects are properly weighted and combined. The location of the line of growth will also always be a source of dispute and is subject to revision. Nevertheless it is becoming universally believed that the fundamental principle underlying the area theory is sound and, as

soon as a Composite Plot can be made truly to represent conditions, prices can be forecast with wonderful accuracy.

As suggested in the first paragraph of this article, I have discussed the subject of "Factors Affecting Prices" under four main headings. First, I discussed prices in general with special reference to the various index numbers now employed; secondly, I discussed the statistical factors and showed mathematically to what the increase and decrease of prices is due; thirdly, I discussed various other general reasons which affect the prices in different localities owing to special causes; and, fourthly, I have discussed how prices are being forecast through the development of the Composite Plot of Business Conditions.

In closing I wish to call the attention of readers to how these various divisions fit together. This most forcibly impresses one by reading, with the Composite Plot in mind, the second section wherein Professor Fisher's formula of exchange is discussed. It will be remembered that  $P$  equals  $M V$  plus  $M'V'$  divided by  $T$  or the volume of trade. When it is considered upon what the Composite Plot is based, it will be seen that said Composite Plot is somewhat of a picture of this important formula of Professor Fisher's. In that same way, if one will read, with the Composite Plot in mind, the quotations in the third section of this article, he will be impressed with their intimate relations, for all of these causes effect the shape of the Composite Plot, while the prices of commodities bear a definite relation to said shape.

In closing, therefore, I urge all readers to give the Composite Plot greater thought and study. We, who are so enthusiastic as to its possibilities, are perfectly willing to grant that at the present time it is in its infancy, and that ten or twenty years hence we will look back with shame upon its present incompleteness. However, the economic principle underlying the area theory is absolutely sound, and if so, should not all of us unite in striving to devise a Composite Plot which will correctly interpret said laws?

Once the nations of the world were dependent upon their armies. The nation which had a Cæsar or a Wellington ruled supreme; later the statesmen ruled, and the nation which had a Pitt or a Bismarck determined the world's policy; but to-day the commercial interests of the nation dictate the world's policy. The credit of our country or of any country during the next ten years does not depend on its

armies or its statesmen, but rather—after character—upon its merchants, manufacturers, bankers and transportation systems. Therefore, as it was once the duty of a nation to see that its young men were trained along military and political lines, is it not our duty to see that our young men are trained to diagnose correctly, and, if possible, forecast business conditions in order safely to guide our great industrial and financial enterprises, upon which the future of our nation is so dependent?